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ARTICLE

The 'Millionaire' method for encouraging participation

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ABSTRACT Encouraging students to participate during class time is important to facilitate the learning process and encourage deep learning to take place. However, students with certain cultural and education backgrounds are often reluctant to participate in class discussion. This article provides some initial insight into the use of the Personal Response System (PRS) to encourage class participation at the postgraduate level. I found that students' participation levels were increased when using the PRS, and further class discussion and debate was stimulated as a result.
KEYWORDS: *Personal Response System, student participation*

Introduction and background

Innovative methods to provide effective learning and teaching are under investigation in most universities in the UK. Some have focused upon the potential benefits of virtual learning environments (for example, Crawford et al., 2001; Morris and Rippin, 2003; Ramsey, 2003; Broad et al., 2004) and new 'technology-led' computer-assisted learning packages (for example, Lane and Porch, 2002). This article examines the use of the Personal Response System (PRS) to improve the level of classroom participation. The necessity for involving and encouraging participation of students from the Far East is an important issue for many universities in Anglo-Saxon countries that have been taking an increasing number of students from the Far East in recent years (Ottewill and Macfarlane, 2003). Cultural differences between students from the Far East and the West, and the impact on student interaction and participation have been documented (for example, Cortazzi and Jin, 1997; Cortazzi, 2002; Turner, 2003). In an attempt to stimulate discussion and encourage greater class participation, I wanted to test the use of the PRS. Specifically, I wanted to find out whether using the PRS technology in my classes would overcome their inhibition

towards making a contribution to class discussions. I also hoped that using the PRS would enhance the learning process for all of the students on my course.

The PRS technology offers the lecturer the opportunity to ask a group of students a series of Multiple Choice Questions (MCQs). Students reply individually to each question posed by selecting a button on a hand-held wireless transmitter. This is similar to 'Ask the Audience' on the television game show 'Who Wants to be a Millionaire?' (Seenan, 2000). At present, only a few companies manufacture the PRS, and to my knowledge, there is not widespread use of this technology in UK universities. However, some studies have found clear benefits of using the PRS in large undergraduate classes in the UK (see for example, Elliott, 2002, 2003; Williams, 2002; Madill, 2003).

On an accounting postgraduate level course at Lancaster University, I tested out the use of the PRS and examined students' reactions to the technology. In particular, I was interested in the reaction of students from the Far East to the PRS as compared to other teaching methods.

This article describes the rationale for using such technology before a discussion of how the PRS works. There will then be consideration of both my own and the students' reactions to using the PRS. The article concludes with a discussion of the advantages and disadvantages of using the PRS and suggestions for future wider use of PRS technology.

Background and rationale for using the PRS

The idea of using MCQs in lectures is not new: before the PRS was developed, lecturers used MCQs in lectures, asking students to respond by raising different coloured cards to vote (see for example, Harden et al., 1968; Dunn, 1969) or raising their hands. Harden et al. (1968) suggests that although lecture preparation time is increased if MCQs are used, more effective teaching and learning during class time takes place. Draper et al. (2002) detail the many pedagogic uses of the PRS, which include formal assessment and the provision of formative feedback to students and lecturers on a real-time basis. Prior evidence suggests that the PRS is useful in many subject areas at the undergraduate level. For example, Hake (1998) concluded that the PRS improved students' problem-solving skills and as a consequence students performed better in subsequent testing. Cue (1998) found that the PRS stimulated student interest for the subject and increased the depth of student learning. Elliott (2002, 2003) found that the PRS is useful for generating and maintaining student interest and checking students' understanding. Therefore a body of literature exists that suggests there are many potential benefits of the PRS at the undergraduate level.

However, to the author's knowledge, there is little evidence of postgraduate students' reaction to the PRS.

I experimented with the PRS on a course which is a compulsory component for students registered on the MSc in Accounting and Financial Management. In recent years students from the Far East have dominated the student cohort. For example in academic year 2002/03, just over half of the class cohort had Chinese nationality, with the remainder of students originating from the UK and mainland Europe, Brazil, India, Malaysia and Taiwan. There can be up to 60 students in this class, although I have also used the PRS successfully in much larger undergraduate classes.

The act of 'making sense' of course material and reconstructing knowledge is an important part of the learning process for students (Jonassen, 1992). There are two extreme learning approaches highlighted by the literature: surface and deep learning strategies. The *surface approach* involves the student skimming over the material and tending to learn things by 'rote' without understanding, rather than considering the linkages between concepts. The *deep approach* is where the student engages fully with the subject matter. A deep learning approach enables the student to make various linkages between topics and see the course as a whole, rather than a series of independent topics (Lucas, 2001). Biggs (1999) suggests that students taking a deep approach will be less likely to have 'knowledge boxes' and fragmented understanding. Such students will therefore be more likely to integrate knowledge and understanding. I particularly wanted to encourage students to make a more active contribution to discussion during class time, to promote linkage between various topics and encourage deep learning to take place.

The PRS encourages students to engage in active learning, maintaining their concentration and attention span in lectures. The course does not have any formal tutorials or seminars for discussion of problems/issues, although I used a number of formats in the sessions including traditional lectures, debate of controversial issues and problem classes. The course sessions were one-and-a-half hours long, thus creating the need for small tasks and short breaks during the lecture to maintain concentration. Maintaining interest and attention is important and MacManaway (1970) and Gibbs et al. (1987) suggest that the average student has an attention span of only around 20 minutes. The PRS was very effective for breaking up the sessions and maintaining student interest. Following the use of the PRS, some time was allocated for discussion. This provided an opportunity for questions of clarification, which is another important component in the learning process (Bligh, 1998). Where a majority of students provided the incorrect answer to a question, there was a period of class discussion/debate used for clarification purposes.

Interaction is an important element because it encourages students to express an opinion on the issues for discussion. These sessions give the opportunity for students to practise their communication skills in a group setting. The PRS is a stimulus for discussion and interaction. It does not *per se* encourage this unless the lecturer stimulates discussion of material after the votes have been cast. I found that the PRS's graphical representation of student responses was a 'talking-point' and I used this to engage students with course material to promote deep learning approaches.

Students of Far Eastern origin, like all others, have perceptions of what makes good teaching. Xiao and Dyson (1999) suggest that, for Chinese students, these include an in-depth knowledge of the subject, the use of effective and interesting teaching methods, an organized and clear presentation of material and an aptitude for encouraging further self-study. Thus it emerges from Chinese students' perspective that good teachers should be able to encourage and motivate self-study rather than participation in the classroom *per se*. However, there is some change emergent in Chinese universities. There has been an attempt to incorporate wider skills development and encouragement of greater participation in class discussion in Chinese universities, although there is inertia and traditional approaches still dominate (Lin and Deng, 1992; Cooper et al., 1994).

The learning preferences of students from the Far East contrast with the typical learning and teaching style used in UK universities. For example, Cortazzi (2002) suggests students from Chinese universities are used to 'learner-trained' teaching. Students typically recite, memorize and learn material and much of students' learning takes place during self-study. This approach to study is often misconstrued as 'rote memorizing' and taking a surface approach to the material (Watkins and Biggs, 1996; Prosser and Trigwell, 1999). However, this is clearly not the case as such students can be deeply engaged in the subject and they often complete vast amounts of self-study (Cooper, 2004). These students are simply not used to responding instantaneously and are often therefore reluctant to contribute to class discussions for fear of giving the wrong answer and 'losing face'. It is probably true to say that such students believe they can learn more from the teacher than from their peers (Cortazzi, 2002). This may lead them to believe there is little that can be achieved and gained through class discussion, despite our emphasis on the importance of debating key issues. The PRS enables students to answer questions anonymously. The lecturer reveals how many students have voted for each option and then there can be a debate about which is the correct answer. Students from the Far East are not used to this type of class discussion. Hence, the students' lack of responsiveness to the prompts for class discussion that I, and doubtless others who teach such students, have experienced in the past is not entirely

surprising. It is also important to acknowledge that not all students 'learn in the same way'; each student has their own preference and this may change over time (Marriott, 2002; Marriott and Marriot, 2003).

What is the Personal Response System and how does it work?

The PRS is used to test students' understanding through a series of Multiple Choice Questions (MCQs). Each student is provided with a handset with buttons for use with MCQs to register their vote. The format of MCQs is flexible and it is possible to use MCQs with up to 10 possible answers. When I used the system, I limited MCQs to five possible answers to ensure questions did not take too long to read and attempt, allowing sufficient time for discussion and debate of student responses.

Following voting there is a wireless transmission of responses to portable receivers placed at the front of the lecture theatre. The receivers are connected to a computer with specific software that collates responses and displays results in the form of a bar chart. I displayed the MCQs on an overhead projector and projected the PRS visual display on to another screen at the same time. Prior to voting a screen of empty cells is shown on the visual display. As each student votes for a particular alternative, a cell is highlighted on the PRS display. It is possible to allow students to vote with 'high' or 'low' confidence, which provides the lecturer some idea of a student's certainty of their answer being correct. When the student inputs a confidence rating before voting this will be indicated by a different colour in the cell on the visual display. This confidence rating is also reflected in the graphical display of results.

There is a time limit for voting during which students have the opportunity to change their vote. (It is possible for the lecturer to vary the amount of time given per question and the number of changes students can make to their vote, depending on the difficulty of the question.) The lecturer asks the question and starts the clock on the programme. The time remaining to answer the question is shown on the visual display. A record of the number of handsets used to vote and the number of attempts made by each handset for each question is kept by the system. The lecturer may retrieve this at a later date. When the voting time is over, a bar chart summarizing the voting for that particular question is shown on the screen. This provides feedback to students and enables the lecturer to see what is well understood and the certainty of students' responses.

It is possible to use the system in either a *named* or an *anonymous* mode. In the *anonymous* mode, as students vote the cell is highlighted and the number of their handset is displayed within this cell. (Each handset has a unique

number on the back and the students can see this number come up on the visual display screen as they vote.) Therefore students are able to identify their vote from the number in the cell, but this is not revealed to their colleagues. This anonymity may be particularly important to students not wanting to 'lose face' in front of their colleagues. Indeed, Cortazzi (2002) suggests that this anonymity is an important factor influencing Chinese students' participation in class discussion.

There is facility for the PRS to be set up for classroom testing where the students are allocated to a particular handset. This involves using the PRS in named mode. When in *named* mode, students have to be allocated to a particular handset. In *named* mode when the vote is registered, the screen cells change colour and indicate the name of the student answering. All the responses for the session are then saved in a file on the computer that may be accessed at a later date. The saved information also includes details of the time taken by each handset to answer every question, the number of attempts made for each question, and the confidence levels of the answers selected. It is clear that the system is very versatile and has the potential for significant benefits for class testing.

My experience

I used the PRS to ask checkpoint questions in one particular topic that students found challenging. This provided a basis to motivate students to engage with the material and check on the concepts and accounting method that had been discussed. I did not reveal the exact format of the class in advance and the use of this technology was a surprise. It was different from the usual format of lectures in this course, which is usually that of a traditional lecture interspersed with student tasks and the discussion of pre-set material or general class discussion. The use of the PRS does constrain the choice of MCQs to some short calculations or interpretative questions, although the format is adaptable to most, if not all, subject areas. I found it was possible to stimulate further debate by incorporating questions based upon the accounting research relating to the pension funding decision and factors influencing this.

The use of the PRS encouraged students to contribute more to the discussion. In addition, there were more questions of clarification asked following the MCQs. As a result of using the PRS, the level of student participation increased and there was more engagement with the subject matter and discussion than had been the case in previous years. I believe that the PRS has key advantages over conducting MCQs 'by hand'. Firstly it provides an accurate representation of the voting by students and enables a more complete view of students' perceptions and understanding to be reflected.

Secondly, the use of the PRS stimulated students' interest, but the greatest change in behaviour was evidenced with the students from the Far East. They were keen to contribute to discussions and ask questions after voting; the PRS appeared to enable them to overcome their inhibition and lack of confidence to contribute to class discussion, resulting in a more engaged approach to learning. Thirdly, I found it easy to learn how to use the PRS and it has very effective results for motivating students and generating a productive learning environment. It did not take students long to get familiar with the PRS technology; I used a couple of practice questions and demonstrated how to vote with 'high' and 'low' confidence, and all were successfully voting using the PRS. A distinct advantage of the PRS is that it allows students the opportunity to check their own understanding, and compare their performance against that of their peers. I found that the PRS has stimulated students' interest and concentration levels in lectures and created a fun and engaging learning environment.

The students' reaction: PRS questionnaire

At the end of the course, I asked the students (anonymously) to complete a questionnaire about the PRS. The PRS questionnaire contained five questions to which students could respond by selecting answers 1 to 5, where 1 indicates strong disagreement and 5 denotes strong agreement. In addition, students were given the opportunity to add any further comments on the PRS at the end of the questionnaire. The questionnaire was based upon Elliott (2003) and the results are shown in Table 1.

In response to the statement 'The PRS is easy to use', students voted with a mean of 4.45 and median of 5. This was expected as when I introduced the technology I gave students a couple of practice questions to enable them to become familiar with the technology. This is similar evidence to that obtained at the undergraduate level by Elliott (2003). Students voted with a mean of 4.25 and median 4.5 in response to the statement 'Using a PRS has increased my enjoyment of lectures'. This suggests that students found using the PRS was fun and contributed positively to the lecture environment. Finding a learning and teaching method which is fun to use is important for motivating all students to contribute to class discussion, particularly when the course material is challenging or complex. I have found that if students enjoy the session, they appear to be more receptive to technical issues and material that otherwise would have been difficult to teach. I firmly believe that the PRS played a vital role in helping students to understand the pension accounting topic on the course.

The student responses for 'Using a PRS has helped my concentration levels in lectures' had a mean 3.75 and median 4.0. This is lower than expected

Table 1 **PRS questionnaire results**
Students were asked to respond to the statements on a scale of 1 to 5, where 1 is 'strongly disagree' and 5 is 'strongly agree'.

Statement	*Responses from students*		
	Mean	Standard deviation	Median
1. The PRS is easy to use	4.45	0.76	5.0
2. Using a PRS has increased my enjoyment of lectures	4.25	0.97	4.5
3. Using a PRS has encouraged me to attend lectures	3.65	1.23	3.5
4. Using a PRS has helped my concentration levels in lectures	3.75	1.21	4.0
5. Using a PRS has increased my confidence on this course	3.35	1.31	3.0

Questionnaire is based upon Elliott (2003)

and contrasts with Elliott (2003) who received a mean (median) response of 4.3 (4.0) for this statement. This is perhaps due to the nature of the students on the course, who are typically highly motivated, although during long sessions it is still important to have a variety of formats to maintain student interest. 'Using a PRS has encouraged me to attend lectures' produced a mean (median) response of 3.65 (3.5). Again, this is not a surprising result and many students on the course commented that they were keen to attend *all* classes and the PRS would not influence this decision.

I found that for certain groups of students, particularly those from the Far East, participation levels were significantly increased by the use of the PRS. However, the final statement 'Using a PRS has increased my confidence on this course' led to a mean (median) response of 3.35 (3.0), which is lower than expected. This suggests that the students did not perceive this as a device for increasing their confidence. However, from the narrative comments, it may be surmised that the students found the PRS useful for clarifying their understanding of certain issues and they felt that they learnt more from participating.

Conclusions

Prior literature has focused on the use of the PRS to encourage participation and engagement with the lecture material at the undergraduate level. The

PRS has also been used to streamline the assessment process. This article provides some preliminary evidence of the merit of using the PRS with postgraduate students, and in particular for overcoming problems of non-participation from certain students from the Far East. Further evidence needs to be collected based upon the use of the PRS at the postgraduate level. For example, the potential benefits of using the PRS for class tests are currently unknown. It would also be useful to investigate student preparation for classes in more depth by introducing more regular quizzes for material covered in preparatory reading. Liebler (2003) suggests that this helps ensure that students are adequately prepared for the class and highlights areas of potential weakness. It will also be useful to explore whether similar results would be obtained on other courses, whether related to this discipline or otherwise. Also, more in-depth analysis of the student reaction to this technology could be done through focus groups and a more detailed questionnaire.

The use of this system is pedagogically diverse: it may be used to assess prior knowledge, introduce new concepts, check student understanding of concepts discussed or re-emphasize certain concepts. It may also be used to check whether students have completed and understood the preparatory reading completed for the class. Questions may be phrased positively or negatively and material from most subject areas could be adapted to use the PRS. The clear advantage of the PRS is that it requires students to actively engage with the subject matter during lecture time, preventing a passive learning approach, often typical of the lecture setting (Synder, 2003). It also allows the lecturer to respond to students' needs by focusing questions on areas of difficulty and provides immediate feedback to the individual, and the student group as a whole based on both their own and relative peer group performance and understanding. Above all the system is fun to use and may, as a consequence, result in better student retention of key concepts and more success in achieving learning objectives (Marston, 2003). The disadvantage of the PRS is that it is not costless, although the cost depends upon the number of handsets and receivers required. It does involve additional time to set up and test the system, although I have found that it only takes about five minutes to set up the system and it appears to be quite reliable. Inevitably since this is computer-based technology, it could on occasion break down or fail, leaving the lecturer to be distracted from the main focus of the lecture (Marston, 2003).

Although the PRS will not suit all lecturers and learning environments, this study demonstrates that the PRS has benefits in terms of increasing and maintaining student participation and attention levels. If the PRS is used in *anonymous* mode it has the added benefit of giving students the opportunity to contribute to discussions anonymously, increasing their confidence to participate more widely in class discussions.

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